INTEGRATOR ELEMENTS OF MANAGEMENT APPLIED TO THE TECHNICAL SYSTEM OF USING CASINGS IN THE MANUFACTURE OF MEAT PREPARATIONS

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Abstract: Analysing the quality of food prepared from meat, some differences from the imposed own standards were frequently determined, due to factors very difficult to determine. Traceability is an important element of food safety, by ensuring the possibility of identifying the path of raw materials to obtain the finished product but does not eliminate the risk of hidden technological flaws, some developing even after delivery to the consumer without control. This paper presents a systemic managerial approach with the use of integrative elements on the entire technical and technological complex of capitalization of membranes used in obtaining meat preparations, following the consideration of hygienic design principles, a concept developing in the European Union.

Key words: management, integrator elements, technical system, hygienic design, casing, meat preparations

1. INTRODUCTION

The sustainability of people's health remains permanently dependent on the quantity, structure and quality of food consumed daily. Meat dishes play a fairly important role in the menus of consumers around the globe. From the economic analyses performed on the consumption of processed meat preparations, the size of the global market for processed meat was USD 519.41 billion in 2019 and is estimated to reach USD 862.97 billion by 2027 (FAOSTAT) [11]. At European level, too, an increase in the consumption of processed meat is forecast, in parallel with a diversification of the assortments and the way of preparation [9]. There are several professional organizations and bodies at European level that are constantly concerned with food security. The European Food Safety Authority (EFSA) is heavily involved in identifying managerial risks in food manufacturing, providing independent risk assessments and scientific advice, to establish food safety standards that are as appropriate as possible to ensure a healthy diet for consumers [9]. The European Commission, which, based on information and statistics on the evolution of the food market, sets rules and policies for safety and quality, is currently working on the implementation of an integrated food safety policy in the EU. A determining factor for food safety is represented by the technical system that ensures the processing of raw materials and ingredients, along the entire chain of technological transformations until obtaining the finished food product, possibly even up to the actual consumption phase. In this context, this paper addresses in particular the management of the technical system that ensures the flow of preparation, processing and use of casings used in the manufacture of meat preparations.

2. SYSTEMIC APPROACH TO CASINGS VALORIZATION MANAGEMENT IN THE MANUFACTURE OF MEAT PREPARATIONS

2.1. Casings valorization in the manufacture of meat preparations

Over the years, the casings have been used in the manufacture of various types of processed meat products to support/package meat mixtures, serving as processing molds, containers during handling and transport and as marketing units for labeling. In the past, the production of preparations was limited to the amount of animal intestines available. With the development of collagen, fibrous carcass and cellulose, production is limited, possibly only by the availability of raw materials. The basic substances of casings are cellulose or collagen. Mainly five types of casings are used: natural, regenerated collagen, cellulose, fibrous and plastic.

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Natural casings are of animal origin and come from the gastrointestinal tract of animals. Natural casings are made of the submucosa, a layer mostly of collagen in the gut. The fat and inner lining are removed. Natural casings have the advantages of traditional appearance, traditional texture and cooking performance, and can be edible. Disadvantages are observed in machinability, low, uneven weights and dimensions, as well as high processing costs. The casings from cattle, pigs and sheep can be used. [7]

In synthesis, the obtaining of natural casings is based on the processing of the intestines. This involves removing the mucous membrane and any unwanted elements, such as animal fat, threads and fluids. This removal is facilitated by a series of hot and cold water washes. Completely cleaned casings are sorted into different type-dimensional categories. Until actual use, they are stored in a saturated saline medium. In order to fill the casings with the meat mixture, the casings can be soaked in a mixture of phosphate, salt and water. This provides the casings with flexibility during processing and an increase in sensitivity after reheating. Also, by absorbing sodium erythorbate from the water mixture, the membranes acquire a better color during heat processing. Usually, it starts with a drying stage, then smoking. With the process of preserving the meat by smoking, the casings acquire a specific color, carefully controlling the concentration reached, the subsequent drying will make the carcass practically impermeable to moisture. The final sensitivity of the casings can also be determined by a control over the relative humidity provided in the smoking unit (75-85%). [3]

Artificial casings obtained from regenerated collagen have many of the physical properties of natural ones, having essentially the same "chemical" material – collagen. Collagen comes from the corium layer of the skin of cattle. The advantages of using the collagen casings refer to the availability of these casings in a variety of sizes, and they are also edible.

Artificial casings based on cellulose are made through a complex process of processing cotton. The processing results in a solution of viscose, which is extruded through nozzles into an acid solution and the cellulose is regenerated as the carbon disulfide is separated from the complex. The wall thickness and tubular diameter can be controlled by the extruder. These finished tubes or casings are composed of pure cellulose, food glycerin and water. Cellulose casings have the ability to be smoke permeable, which gives the final product an attractive appearance for the consumer. The casings are also permeable to moisture to some extent. Cellulose casings are impermeable to organic molecules, such as meat emulsion. Cellulose casings can be obtained in a wide variety of sizes. They are stored dry and must be soaked before filling. They are not edible.

Fibrous casings are made by impregnating a similar strong paper with cellulose. Fibrous casings have good workability and uniformity, which adapts well to high-speed operations. The fibrous casings are made in such a way as to adhere to the surface of the meat mixture, favorable to dry and semi-dry sausages. There are a variety of sizes of fibrous casings that offer processed meat processors a large number of assortments, according to market preferences.

Plastic casings are impermeable to moisture and smoke, being based on the PVDC type of plastic. These casings can be produced in a wide variety of sizes and colors, increasing the attractiveness of products to consumers.

The choice of the type of casings is part of the policy of the producer of processed meat preparations, in relation to the target market.

From the analysis of the managerial modalities applied in each case of capitalization of the casings in the manufacture of meat preparations, there is an independence between the casings producer and the one who uses these membranes to obtain finished products, meat preparations.

2.2. The systemic approach

Each casing uses a complex technical set of equipment to carry out the necessary technological operations, following the required chemical and physical-mechanical characteristics, without a clear vision on the quality of the finished food, on the necessary food safety, in favor of the consumer.

In general, the systemic approach in management aims at understanding and controlling complex and evolving structures. The proliferation of complex structures is a dominant trend in modern economies, because complexity, unlike simple structures, cannot be decomposed and recomposed without information loss, since complexity management requires certain concepts and techniques different from those specific to traditional management. It is appreciated that complexity management can be considered as one of the essential paradigms of the future.

The systemic approach in management does not oppose the holism of reductionism and the global of the local, but, on the contrary, tries to reconcile analytical images with integrative ones, showing that the whole is found in each of its parts, and each part is a small-scale projection of the whole. The systemic approach does not give up the logical-analytical tools that investigate reality by dissecting, fragmenting and decomposing it into constituent elements, but capitalizes on them to obtain morphological, synthetic, but dynamic and lively developments of this reality. The principle of systemicity uses both deduction and induction, analysis and synthesis, inference and utterance to discover the interdependencies and internal connections that set in motion the complexly organized ensembles. The true valences of this approach are not found in the simplistic schemes of the "entry-exit" type or in the "circular" models, which enshrine another kind of formalism, but in the reflexive-constructivist strategies for interpreting the socio-economic structures. [1]

The systemic approach refocuses the attention from the parts to the whole, proposing a diametrically opposite optics: the deduction of the properties of the elements from the functional qualitative state of the whole. In this way the emphasis shifted to the study of structural dynamics.

It is observed that currently the systemic approach has developed, based on the study of "feedback loops" or inverse connections (feedback), homeostatic models characterized by the existence of information circuits that have as a starting point certain inputs for a process, which changes the initial state of the system in one direction or towards a single output. In these models, management appears as a feedback-based regulation of the processes, by allocating the available resources in the context of keeping under control all the operating sequences necessary to obtain the projected results in the praxiological structure of the system objective. In this family of models, the managerial decision is defined as the exercise of control over the dynamics of the entire system.

The contemporary stage of evolution of the systemic approach methodology is dominated by adaptable models with self-organization. These models are based on the positive, destabilizing inverse connection, but which seeks new forms and functional combinations: not all disturbances should be considered dysfunctions. Many of the so-called "functional pathologies", under certain conditions, can be sources of creativity and innovation, catalysts for the reorganization of the system on new functional landmarks. Models of this generation offer a richer, more complex view of the organizational change of economic systems, showing that the transition to a new order (state), possibly a qualitatively superior one, is caused not only by inputs or external factors, but by a combination of both exogenous and endogenous forces, which feed and support each other. Consequently, the environment plays a key role in shaping the structural configuration and behaviors of the system. Self-organizing processes form the mechanisms by which internal dynamics are connected to changes in the environment, and crises and disorders are converted into the foundations of a new way of organizing. The functioning of the real economic systems takes place by coupling some regulation flows either by fluctuations between the periods of relative stability and the periods of restructuring, or by the autotransformation of the system itself, preserving its normative profile.

Thus, the use of casings in the manufacture of meat preparations must be viewed through the prism of a systemic approach in support of the implementation of a complex management, including organizational components that make possible the optimal functioning of the technical system, taken as a whole.

This approach does not eliminate traceability, but incorporates it, remaining an important element of food safety, providing management with detailed information on the status of raw materials at each technological stage. Also, all the equipment used and included in the whole technical system considered is known. In this way, a reduction in food safety risks is expected, due to possible hidden technological defects, which can become small centers of contamination, which could lead to a deterioration of the quality of the preparation even after delivery to the consumer, without any control.

3. PRINCIPLES OF HYGIENE DESIGN FOR MEAT PREPARATION FACTORIES

In 1989, a group of equipment manufacturers, food producers, food industry suppliers, research institutes and universities, public health authorities and government organizations founded a non-profit consortium European Hygienic Engineering & Design Group (EHEDG). From the beginning, this group aimed to promote safe food by improving engineering and hygienic design in all aspects of food manufacturing.

EHEDG actively supports European legislation, supporting the imposition throughout the European food industry, of the hygienic handling, preparation, processing and packaging of food using hygienic machines and in hygienic spaces, as provided for in the Food Hygiene Directive, the Machinery Directive and the food contact materials regulations (EC Machinery Directive 2006/42/EC, EN 1672-2 and EN ISO 14159 on hygiene requirements for machine design). EHEDG provides guidance to equipment manufacturers and users, who are responsible for implementing the requirements set out in the essential standards of hygienic design, in accordance with national and international law. EHEDG is involved in each national branch established in most European countries to raise awareness of hygienic engineering, expanding good practices, guidance in solving problems, forming a platform to promote EHEDG expertise that facilitates the use of a whole network of expert engineers in the whole world. [6]

In order to design an integrated management system on the technical system applied in the use of membranes in the manufacture of meat preparations, we started from the premise of ensuring the quality and food safety of these preparations by proper hygienic redesign and maintenance of food production systems. A variety of practical guidance documents on appropriate hygienic design in various areas of used production equipment and machinery, as well as on the necessary manufacturing infrastructure, were consulted. Of the 55 document titles developed so far by EHEDG, the following have been studied in particular:

- Microbiologically safe aseptic packing of food products, (3)
- Hygienic design principles, (8)
- Welding stainless steel to meet hygienic requirements, 9
- Hygienic packing of food products, (11)
- Hygienic design of equipment for open processing, (13)
- Integration of hygienic and aseptic systems, (34)
- Hygienic welding of stainless steel tubing in the food processing industry, (35)
- Hygienic Design Principles for Food Factories, (44),
- Testing of Hygienic Weld Joints, (54). [8]

Based on the content of these guides, customized instruction packs are prepared for each technical system on the entire manufacturing flow of each meat preparation.

The implementation of these instructions strengthens the authority required by the ISO 22000: 2018 certification "Food safety management systems – Requirements for any organization in the food chain. [10]

4. INTEGRATION OF THE MANAGEMENT SYSTEM REGARDING THE USING OF THE CASINGS IN THE MANUFACTURE OF MEAT PREPARATIONS

It is proposed to apply in the technical system refering to the use of casings in the manufacture of meat preparations the integrative principles of management, especially to reduce duplication of activities and to increase economic efficiency, reducing some costs, anticipating some potential savings.

In today's competitive business environment, streamlining operations is essential to keep overall overheads low. The key principles of integrated management lead to a consolidation of systems. Integrated management systems eliminate the running of separate management systems in parallel. [4]

The main motivation for managerial integration starts from the central consideration of the quality of food prepared from meat. Moreover, the idea of including subsystems for the preparation and filling of casings is adopted, together with the stages of processing the whole meat preparation, including the food act itself. Thus, the technical system that is used throughout the chain, from raw materials to food consumption is to be addressed as a whole. This multiple integration of management leads to beneficial effects on consumer health. [5]

This approach supports the concept of integronic alimentation. Integronic foods have forms of manifestation both at a super individual level and at a larger level. The concept of integronic food is the scientific approach that studies integrated food systems (consequently to their coexistence) and integration processes in the idea of dynamic balance, given elements of epigenetic and food profile at individual or population level, given the dynamics of food act synchronous and syncretic, based on emerging integration and synergy. Integronic food lays the conceptual foundations for the harmonization of the quantity-quality relationship. The concept can then generate technologies that lead to the harmonization of the relationship between food production, both in impact with nutritional balance and satiety, and in impact with the environment, avoiding pollution. [2]

The characterization of these foods is made according to a matrix model that represents the means by which food is structured and defined from the perspective of nutritional integration and harmonization, achieved through the integronic dynamics of food processes, taking into account its nutritional, metabolic, genetic and ecological components. complex systems. The food matrix can have different (multiple) levels of integration, both at the super individual level, where it takes the complex form of environment-food-organism integron matrix, and at the individual level, where it is constituted in a food matrix organism and which characterizes itself through deeper and deeper integration stages: macronutrients, micronutrients, non-nutrients, complementary energy, etc. [2]

From the perspective of the orientation of meat preparations recipes towards the group of integrated foods, the casing-meat mixture relationship must be appropriate to the principles related to this food group. Also, the principles of hygienic design, which also involve additional sanitary surveillance measures, will contribute to reducing the risks of deteriorating the quality of the finished product, even at the time of consumption.

5. CONCLUSIONS

Nutritional principles have undergone interesting changes over time due to both the cultural evolution of populations and the technological supply of increasingly processed and synthesized food. The new concept of integrated foods is a possible prediction of the globalized food perspective. In this situation, the implementation of integrated management systems is timely. But the characteristics of these systems differ greatly in relation to the specifics of the food chain.

The case of meat preparations using casings is even more special as the present technologies do not ensure the full guarantee of the quality of the finished products, each producer seeking the allocation of the lowest possible costs, which is why some hidden risks have been found in different positions, technical system – support of the chain of designed transformations. Thus, the systemic approach through which this integrated management model was proposed to be applied to the technical system of using casings in the manufacture of meat preparations, is an efficient constructive way, from an economic point of view, but with a clearer perspective on the possibilities of reducing the risks of impaired quality and increased food security.

This integrated management of the technical system may have its scope also of the innovative elements applied in the food technical chain for the manufacture of meat preparations.

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